In the Claims

The following is a copy of the claims that identifies language being added with underlining ("_____") and language being deleted with strikethrough ("-----"), as is applicable:

1. (Currently Amended) A charge pump fabricated on a substrate for use in a phase lock loop system, the charge pump comprising:

a first input stage having a first input transistor that receives a first control signal, a first complementary transistor, and a first discharging transistor,

where the source terminals of the first input transistor and the first complementary transistor are connected with a drain terminal of the first discharging transistor, and the first complementary transistor is operable to receive a first reference signal having a substantially constant voltage;

a second input stage coupled to the first input stage, the second input stage having a second switching transistor that receives a second control signal, a second complementary transistor, and a second discharging transistor,

where the source terminals of the second input transistor and the second complementary transistor are connected with a drain terminal of the second discharging transistor, and the second complementary transistor operable to receive a second reference signal having a substantially constant voltage; and

~~first and second~~ a first output ~~nodes~~ terminal for ~~transmitting~~ providing an output signals having reduced switching noise, the ~~first and second~~ output ~~nodes~~ terminal being coupled to the ~~first and~~ second complementary transistor~~s, respectively~~.

2. (Previously Presented) The charge pump of claim 1, where the charge pump is operable to receive the first and second reference signals from a voltage divider circuit.

3. (Previously Presented) The charge pump of claim 2, where the first and second reference signals are substantially the same.

4. (Currently Amended) The charge pump of claim 3, where each of the first and second reference signals are substantially half the supply voltage.

5. (Currently Amended) The charge pump of claim 2, where the voltage divider circuit comprises a plurality of interdigitized resistors.

6. (Previously Presented) The charge pump of claim 1, where the first and second reference signals are received from first and second voltage divider circuits.

7. (Previously Presented) The charge pump of claim 6, where the first and second reference signals are substantially the same.

8. (Previously Presented) The charge pump of claim 1, where the first reference signal includes a constant voltage level that is between minimum and maximum voltage levels of the first input signal.

9. (Previously Presented) The charge pump of claim 8, where the first reference signal includes a constant voltage level that is substantially equal to a midpoint of a voltage range of the first input signal.

10. (Previously Presented) The charge pump of claim 8, where the first complementary transistor switches on substantially when the first input transistor switches off and the first complementary transistor switches off substantially when the first input transistor switches on.

11. (Currently Amended) The charge pump of claim 10, where the second complementary transistor-switches on substantially when the second input transistor switches off and the second complementary transistor switches off substantially when the second input transistor switches on.

12. (Canceled)

13. (Previously Presented) The charge pump of claim 1 further comprising a biasing circuit that provides a biasing signal to gate terminals of the first and second discharging transistors.

14. (Currently Amended) The charge pump of claim 13 ~~wherein one of the first and~~ further including a second output ~~nodes~~ terminal that ~~connects with~~ is coupled to a filter that reduces coupled switching noise of at least one of the first reference signal and the second reference signal ~~at an output node of the filter~~.

15. (Currently Amended) The charge pump of claim 14, where the filter comprises ~~a~~ transistors ~~based filter~~ configured to provide capacitance and resistance.

16. (Currently Amended) The charge pump of claim 15, where the second output terminal ~~a filter output~~ connects with ~~the~~ a voltage-to-current converter.

17. (Previously Presented) The charge pump of claim 1, where the first and second input transistors comprise switching transistors.

18. (Previously Presented) The charge pump of claim 1 further comprising a first charging transistor connected between a supply voltage and the first input transistor and a second charging transistor connected between a supply voltage and the second input transistor.

19. (Previously Presented) The charge pump of claim 18 further comprising a third charging transistor connected between the supply voltage and the first complementary transistor and a fourth charging transistor connected between the supply voltage and the second complementary transistor.

20. (Previously Presented) The charge pump of claim 1, where the charge pump operates with a supply voltage of less than 2.5 volts.

21. (Previously Presented) The charge pump of claim 20, where the charge pump operates with a supply voltage of less than 1.9 volts.

22. (Previously Presented) The charge pump of claim 20, where the charge pump has at most three transistors connected via source and drain terminals between the supply voltage and ground.

23. (Currently Amended) The charge pump of claim 1, where the signals at the first ~~and second~~ output ~~nodes are~~ terminal is substantially isolated from signal noise in the first and second control signals.

24. (Currently Amended) The charge pump of claim 23, where the signals at the first ~~and second~~ output ~~nodes are~~ terminal is substantially isolated from switching noise caused by the first and second input transistors.

25. (Currently Amended) The charge pump of claim 1 further comprising:

first and second charging transistors connected between a supply voltage and the first and second input transistors, respectively;

a voltage divider circuit that provides ~~a~~ the first reference signal and the second reference signal to gate terminals of the first and second complementary transistors, where the first reference signal and the second reference signal ~~is~~ are each substantially half the supply voltage;

third and fourth charging transistors connected between the supply voltage and the first and second complementary transistors, respectively;

a biasing circuit that provides a biasing signal to gate terminals of the first and second discharging transistors; and

a filter comprising transistors operable to reduce coupled switching noise at ~~an~~ second output ~~node~~ terminal of the filter;

where the first complementary transistor switches on substantially when the first input transistor switches off and the first complementary transistor switches off substantially when the first input transistor switches on.

26 - 27. (Canceled)

28. (Currently Amended) A method of pumping a charge in a semiconductor based charge pump for use in a phase lock loop circuit, comprising:

receiving first and second input signals at first and second switching transistors;

providing a ~~biasing signal~~ substantially constant reference voltage to first and second complementary transistors to reduce coupling noise from the first and second switching transistors, wherein ~~such that~~ the complementary transistors change states between off and on substantially complementary to the state of the respective first and second switching transistors; and

generating a first output signal from ~~at least one of~~ the ~~first and~~ second complementary transistors.

29. (Currently Amended) The method of claim 28, further comprising filtering noise from the reference signal to provide a second output signal to a voltage-to-current converter ~~providing a second output signal from the other of the at least one of the first and second complementary transistors, where the first and second output signals form a differential pair~~.

30. (Currently Amended) A differential charge pump for use in a phase lock loop, comprising:

a first transistor pair, comprising a first switching transistor and a first complementary transistor;

a first switching transistor gate, associated with the first switching transistor, coupled to a first control signal, and a first complementary transistor gate, associated with the first complementary transistor, being coupled to a constant ~~bias~~ reference voltage such that the first complementary transistor is indirectly controlled by the first control signal;

a second transistor pair, comprising a second switching transistor and a second complementary transistor; and

a second switching transistor gate, associated with the second switching transistor, coupled to a second control signal, and a second complementary transistor gate, associated with the second complementary transistor, being coupled to the constant ~~bias~~ reference voltage such that the second complementary transistor is indirectly controlled by the second control signal.

31. (Cancelled)

32. (Original) The differential charge pump of claim 30, wherein the first switching transistor is coupled between a first current source and a first current sink.

33. (Original) The differential charge pump of claim 32, wherein the first complementary transistor is coupled between a first cascode transistor pair and the first current sink.

34. (Original) The differential charge pump of claim 33, wherein the first cascode transistor pair is coupled to a supply voltage.

35. (Currently Amended) The differential charge pump of claim 34, wherein the ~~first bias~~ reference voltage is less than the supply voltage.

36. (Currently Amended) The differential charge pump of claim 34, wherein the ~~first bias~~ reference voltage is approximately half of the supply voltage.

37. (Currently Amended) The differential charge pump of claim 34, wherein the supply voltage is approximately 3 Volts and the ~~first bias~~ reference voltage is approximately 1.5 Volts.

38. (Original) The differential charge pump of claim 30, wherein the indirect control of the first complementary transistor by the first control voltage reduces switching noise in the differential charge pump.

In the Drawings

Applicant has enclosed a red-lined copy of the figures showing the amendments made to the figures, and have also enclosed clean-copy replacement sheets that incorporate the changes noted in the red-lined figures.